

REMARKS

By this Amendment, Claims 1-42 have been canceled without prejudice to or disclaimer of the subject matter contained therein. Claims 43-74 are pending. Reconsideration of the July 7, 2003 Official Action is respectfully requested.

1. Telephone Interview

Applicants thank Examiner Walls for the courtesies extended to Applicants' undersigned representative during the September 23, 2003, telephone interview. Applicants' separate record of the substance of the interview is incorporated in the following remarks.

**2. Rejection of Claims 1-22, 25-30, 33-58, 60-69, and 71-74
under 35 U.S.C. §103**

Claims 1-22, 25-30, 33-58, 60-69, and 71-74 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 4,193,412 to Heim et al. ("Heim") in view of U.S. Patent No. 3,472,237 to Stephens. The reasons for this rejection are stated at numbered section 3, on pages 2-4 of the Official Action. The rejection of Claims 1-42 is moot. The rejection of Claims 43-58, 60-69, and 71-74 is respectfully traversed.

Independent Claim 43 is directed to "a cut filler composition comprising tobacco and at least one additive *capable of acting as an oxidant for the conversion of carbon monoxide to carbon dioxide and/or as a catalyst for the conversion of carbon monoxide to carbon dioxide*, wherein *the additive is in the form of iron oxide nanoparticles*" (emphasis added). Heim and Stephens fail to suggest the cut filler recited in Claim 43 for the following reasons.

It is asserted in the Official Action that Heim discloses a tobacco product, wherein the natural tobacco used as a smoking material contains a metal oxide additive. It is acknowledged in the Official Action that Heim does not disclose that the purpose of the metal oxides is to act as an oxidant or as a catalyst for the conversion of carbon monoxide to carbon dioxide. However, it is asserted that Heim discloses that the metal oxide additives are utilized for their superior ability to remove toxic substances from tobacco smoke. It also is asserted that it is known that the principal function of the metal catalyst during the smoking of a cigarette is to catalyze the oxidation of the carbon monoxide generated to carbon dioxide (citing to Stephens), and that this suggests metal oxides serve to *both* oxidize carbon monoxide *and* catalyze the oxidation process. It is further asserted that it would have been obvious to utilize the metal oxides disclosed in Heim for this purpose in order to reduce the toxic components of cigarette smoke.

The Official Action acknowledges that Heim does not disclose that the additives could be iron oxide. However, it is asserted that Heim states that various types of metal oxides may be used as an additive, and that Stephens indicates iron oxide, specifically, is a preferable metal species to effectuate\promote conversion of carbon monoxide to carbon dioxide. It also is asserted in the Official Action that it would have been obvious to utilize iron oxide as an additive to the tobacco material of Heim modified by Stephens because it is a metal oxide known for promoting the formation of carbon dioxide and for reducing toxic substances in cigarette smoke. Applicants respectfully disagree with these assertions.

Heim discloses an additive for tobacco products including a mixture of at least two highly dispersed metal oxides, metal oxyhydrates or mixtures thereof (Abstract and column

2, lines 42-55). Heim discloses that the additive has an *absorptive* power for gases and vapors, especially tar (Abstract; column 1, lines 32-35; and column 2, lines 7-12 and lines 50-55). "Absorb" means "to take (something) in through or as through pores or interstices." *The American Heritage College Dictionary* 5 (3rd ed. 2000). In contrast, a "catalyst" is "a substance that modifies and increases the rate of a reaction without being consumed in the process." *The American Heritage College Dictionary* 219-220 (3rd ed. 2000). Heim does not disclose or suggest that the additive acts as an oxidant and/or catalyst for the conversion of carbon monoxide to carbon dioxide, as claimed. Nor does Heim disclose or suggest that it would be desirable for the additive to act as a catalyst or an oxidant for this reaction.

Moreover, Heim discloses that the "crux of the present invention" resides in an additive for smoking tobacco products and their filter elements consisting of different metal oxides and/or metal oxyhydrates. Heim discloses that the mixture exhibits liquid-like properties, and that certain properties of the mixture, including *absorptive* power for toxic substances in tobacco smoke, is synergistically increased. However, Heim does not disclose or suggest using iron oxide in any such mixture.

Stephens fails to cure Heim's deficiencies regarding the cut filler recited in Claim 43. Stephens discloses a process comprising treating tobacco pre-treated to substantially decrease the moisture content by contact with a drying medium. The process comprises impregnating tobacco with a metal oxide impregnate selected from the group consisting of iron, calcium and copper oxides, and mixtures of anhydrides thereof. The metal oxide is in the form of a dispersion with an active carrier selected from the group consisting of

reducing sugars and carbohydrates hydrolyzable to reducing sugars (col. 1, lines 11-23).

Stephens does not disclose or suggest a cut filler composition comprising at least one additive in the form of iron oxide nanoparticles. Accordingly, Stephens provides no motivation to modify Heim's additive to include such iron oxide nanoparticles.

Furthermore, Heim discloses that the additive for smoking tobacco acts as an absorbent, while Stephens discloses that the *principal function* of a metal oxide catalyst is to *catalyze* the oxidation of carbon monoxide produced in combustion in smoking process to carbon dioxide. Accordingly, Stephens provides no motivation to modify Heim's additive to be capable of acting as an oxidant and/or a catalyst for the conversion of carbon monoxide to carbon dioxide.

MPEP §2143 sets forth the requirements of a *prima facie* case of obviousness. Particularly, in order to establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in knowledge generally available to one of ordinary skill in the art, to combine reference teachings. In addition, the references when combined *must* teach or suggest all of the features of a claim (*see also* MPEP §2143.03).

However, Stephens provides no motivation to modify Heim to incorporate an additive that acts as a catalyst and/or an oxidant for the conversion of carbon monoxide to carbon dioxide. Secondly, neither Heim nor Stephens discloses or suggests an additive in the form of iron oxide *nanoparticles*, much less such an additive used in cut filler. Thus, even if the teachings of Heim and Stephens were combined without motivation to do so, the modified additive of Heim still would not include all of the features recited in Claim 43.

Furthermore, the specification provides evidence of unexpected results that can be provided by an additive in the form of iron oxide nanoparticles. Particularly, as described on page 12, first paragraph of the specification, Fig. 3 shows a comparison between the catalytic activity of Fe_2O_3 *nanoparticles* having an average particle size of about 3nm, versus that of Fe_2O_3 powder having an average particle size of about $5\mu\text{m}$ (i.e., about 5000nm). As shown in Fig. 3, the Fe_2O_3 nanoparticles have a much higher percentage of conversion of carbon monoxide to carbon dioxide than the larger Fe_2O_3 powder. In addition, the iron oxide nanoparticles exhibited catalytic activity at much lower temperatures than the larger Fe_2O_3 powder. These results demonstrate that iron oxide nanoparticles provide an unexpectedly superior ability to catalyze the conversion of carbon monoxide to carbon dioxide as compared to iron oxide particles that are not nanoscale size. It is respectfully submitted that these unexpected results are sufficient to rebut any alleged *prima facie* case of obviousness of the additive recited in Claim 43 over Heim and Stephens.

For the foregoing reasons, the cut filler composition recited in Claim 43 is patentable over the combination of Heim and Stephens.

Claims 44-52 depend from Claim 43 and thus also are patentable over Heim and Stephens for at least the same reasons that Claim 43 is patentable. For example, Claim 52 recites that "the additive oxidizes and/or catalyzes the conversion of carbon monoxide to carbon dioxide at a temperature of from about 200°C to 600°C." Stephens discloses that smoke products form in cigarettes at a temperature of about 850° to 900°C, and that "*at this temperature*, metal oxides, such as *iron*, calcium and copper, are reduced to the

metallic state and there effectively catalyze reaction of the oxidation of the CO-CO₂" (emphasis added; col. 2, lines 38-41). Thus, Stephens teaches that the iron oxide catalyst does not effectively catalyze the reaction of the oxidation of carbon monoxide to carbon dioxide at the temperature recited in Claim 52. Thus, the cut filler recited in Claim 52 also is patentable over the cited references.

Independent Claim 53 is directed to a cigarette comprising a tobacco rod, which comprises a cut filler as recited in Claim 43. Accordingly, the cigarette recited in Claim 53 also is patentable over the combination of Heim and Stephens for at least the same reasons that Claim 43 is patentable.

Claims 54-63 depend from Claim 53 and thus also are patentable over the combination of Heim and Stephens for at least the same reasons that Claim 53 is patentable.

Independent Claim 64 recites method of making a cigarette, which comprises, *inter alia*, "(i) adding an additive to a cut filler, wherein the additive is capable of acting as an oxidant for the conversion of carbon monoxide to carbon dioxide and/or as a catalyst for the conversion of carbon monoxide to carbon dioxide, wherein *the additive is in the form of iron oxide nanoparticles*" (emphasis added). Accordingly, the method of making a cigarette recited in Claim 64 also is patentable over the combination of Heim and Stephens for at least the same reasons that Claim 43 is patentable.

Therefore, withdrawal of the rejection is respectfully requested.

3. Rejection of Claims 23-24, 31-32, 59, and 70 under 35 U.S.C. §103

Claims 23-24, 31-32, 59, and 70 stand rejected under 35 U.S.C. §103 over Heim and Stephens, and further in view of U.S. Patent No. 4,574,821 to Fischer et al.

("Fischer"). The reasons for the rejection are stated on page 5 of the Official Action. The rejection of Claims 23, 24, 31, and 32 is moot. The rejection of Claims 59 and 70 is respectfully traversed.

Fischer fails to cure the deficiencies of Heim and Stephens regarding Claims 53 and 64. Accordingly, the combinations of features recited in Claims 59 and 70, which depend respectively from Claims 53 and 64, also are patentable over the cited references.

Withdrawal of the rejection is respectfully requested.

4. Conclusion

For the foregoing reasons, it is submitted that the application is in condition for allowance and such action is earnestly solicited.

Respectfully submitted,

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